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# ***How to Build a Wood Raised Garden Bed***

## **Why a Wood Raised Garden Bed...**

A wood raised garden bed, filled with a mixture of soil and compost, is a convenient and effective way for a home gardener to grow healthy food. After the bed is constructed and filled it can be immediately planted with your favorite fruits and vegetables.

Generally, these beds are 4 feet wide in lengths of 8 to 12 feet and constructed of rot-resistant lumber. The height of beds varies from 8 to 12 inches; however, they can also be built to accommodate a person with limited mobility - these beds are usually between 18 to 30 inches tall depending on the specific needs of an individual.

Construction of a wood raised bed is simple and is easily accomplished by a home gardener. The materials and tools needed are basic and easily obtained.

### Materials

- Lumber
- Hardware, screws and washers
- Glue, exterior wood (optional)

### Tools

- Circular saw (optional, it is best to have the lumber yard cut the boards to size for you)
- Electric drill or impact driver drill
- Drill bits and screwdriver heads (for type of screw used)
- Socket wrench or adjustable wrench (only if hex head screws are used)
- Shovel
- Carpenter square or triangle (optional)
- Level (optional)

The exact materials and tools needed will depend on the type of bed you decide to build. The following information is provided to help you select the materials that best fit your situation and what tools you will need.

## **Lumber, Options for Building Raised Garden Beds**

### **Varieties:**

Cedar This is the most commonly used lumber for raised beds. It is a long lasting, light weight wood that is not prone to splitting and twisting. Cedar is commonly used for landscape structures and is widely available from local lumber yards. If you have environmental concerns purchase cedar lumber that is certified by the Canadian Standards Association (CSA), Sustainable Forest Initiative (SFI) or the Forest Stewardship Council (FSC). In Ohio native Red Cedar can also be purchased locally from regional mills. One difference between the native Red Cedar and other cedar is it is a smaller tree, and the boards are only available in widths up to 8 inches wide and 8 feet in length.

### Other Regional Hardwood Options:

White Oak can be locally sourced, but boards are very heavy and should not be ordered in a thickness over 1 1/2 inches. White Oak will last longer than Pine, but not as long as cedar - it is also more prone to splitting and warping. When working with White Oak self-tapping screws will not work.

Locus can be locally sourced, but boards are very heavy and should not be ordered in a thickness over 1 1/2 inches. Locus should last as long as Cedar but is more prone to splitting and warping than Cedar. When working with Locus self-tapping screws will not work.

Pine Using untreated Pine is not recommended because the expected lifespan is three, or perhaps fewer, years. Pine can be treated with products such as linseed oil or polyurethane to extend the life of the garden bed.

### Pine, Pressure-Treated

Many people are concerned about the safety of using treated lumber in food gardens. At this time there are varying opinions about the safety of using treated lumber for raised vegetable garden beds. The information here is provided to help you make an informed personal choice as to whether or not to use pressure treated wood.

Prior to 2004 chromated copper arsenate (CCA) was used on pressure-treated lumber as a preservative. The CCA pressure treated lumber should never be used for a vegetable garden raised bed. In January of 2004 the United States Environmental Protection Agency (USEPA) prohibited CCA to be used to treat wood intended for any residential uses. Today as a safer alternative alkaline copper quat (ACQ) or copper azole (CBA) are used to treat lumber - this lumber does not contain arsenic or chromium. This lumber does contain copper. Copper is an essential element for both plants and animals, however excessive amounts can be harmful. In a 2007 study about the safety of ACQ, published in Human and Ecological Risk Assessment, it was concluded that "exposure to copper from contact with ACQ-treated wood is not expected to have adverse effects on the health of adults or children." Copper azole (CA) is another wood preservative based on the fungicidal properties of copper. Its toxicity risk should be similar to that of ACQ. Please note that if your garden or farm is working with United States Department of Agriculture (USDA) Organic standards CCA, ACQ and CA treated lumber cannot be used.

### References:

- Pressure-Treated Wood: Organic and Natural Alternatives, Lee Rinehart, NCAT Agriculture Specialist, 2011, Published September NCAT IP362 Slot 209 Version 091511 [www.attra.ncat.org](http://www.attra.ncat.org)
- University of Missouri Extension, Publication #g6985
- Virginia Cooperative Education, [http://pubs.ext.vt.edu/426/426-336/426-336\\_pdf.pdf](http://pubs.ext.vt.edu/426/426-336/426-336_pdf.pdf)
- York State Department of Environmental Conservation, <http://www.dec.ny.gov/chemical/8790.html>
- USDA Organic Certification Regulation §205.206(f)

### Composite Lumber

Composite lumber is commonly used for raised garden beds; it is a product made of high-density polyethylene (HDPE) plastic. HDPE is a durable, non-leaching, plastic usually made of recycled from milk jugs. It is used for outdoor furniture, park benches, decking, trash bins and other products that need to be rot-resistant, long-lasting and able to withstand adverse weather conditions.

Composite lumber comes in 1"x4" to 1"x6" planks (6" is the widest) so in most situations you will need to use a two-tier frame for your garden bed. The two-tier frame will need to be lapped with vertical braces every three feet. In addition, when using composite lumber, it is important to take into consideration that it has poor linear strength and over an eight-foot section it will bow out as the soil settles in the garden bed. For this reason, you will need to reinforce the sides every three feet of an eight-foot (or longer) section. In addition, corners will need to be reinforced with vertical pieces of 4"x4" or 2x4" and only exterior decking screws, designed for HDPE composite lumber, should be used.

The HDPE composite lumber is a long lasting recycled material so there are environmental advantages to using it, however it is expensive so you will need to consider if for your project the upfront cost is offset by the long-life of the product.

### Redwood

Long lasting but very expensive, in addition there are environmental concerns, so it is not recommended.

**Do Not Use Scrap (Salvaged) Lumber** if you do not know its age or origin. The lumber may contain arsenic (used in older pressure treated lumber) or have been painted with lead paint.

### **PLEASE NOTE:**

1. Lumber directly from a mill is green, not kiln dried, so it important to use it as soon as possible to avoid bowing and warping. It is also more difficult to drill so a professional grade drill or impact driver drill will need to be used. With green lumber it is also recommended to pre-drill for even self-tapping screws.

### **Lumber - Planed Dimensions**

Size	Actual Size
2 x 4	1 1/2" x 3 1/2"
2 x 6	1 1/2" x 5 1/2"
2 x 8	1 1/2" x 7 1/4"
2 x 10	1 1/2" x 9 1/4"
2 x 12	1 1/2" x 11 1/4"

## Raised Bed Hardware / Fasteners

### For Cedar and Pine:

Construction Lag Screws

Hillman Group 5/16" x 4 or 5" in length depending on lumber thickness

For beds 8 - 10 high, two (2) screws per corner - eight (8) per bed

Pre-drill both the end and side boards

The Hillman Construction Lag Screw uses a T30 star-bit driver

Washers, galvanized 3/8" - eight (8) per bed

With 8" boards have the screws centered a 1 1/2" from the top and bottom of the board. With boards 10" or 12" have the screws centered and 2" from the top and bottom of the board.

Standard exterior decking screws can also be used although they do not hold up as well as lag screws. When using them a corner brace bed design should be used and screws with a "star type" head is recommended. The length of the screw would be determined by the thickness of lumber used - for example when using 2"x8" planned (dimensional) lumber you would use a screw 2 1/2" in length - you do not want the screw to pass through the back side of board. With decking screws washers are not used.

### For White Oak and other Hardwoods:

Galvanized Hex Lag Screw

With a Galvanized Hex Lag Screw use a 3/8" (smaller galvanized lag screws break off during construction)

Washers, galvanized 3/8"

Pre-drill both the end and side boards

5/16" auger bit

3/8" socket wrench or driver head

### For Composite Lumber:

There are screws (Pan-Head Star-Drive Composite Deck Screws) specifically designed for use with Composite Lumber, they have a special head that does not tear the lumber. When using Composite Lumber, a corner brace bed design must be used, a 4"x4" is recommended. The length of the screw would be determined by the thickness of boards which will be 1 inch. With composite deck screws washers are not used. In addition, the sides of the bed need to be reinforced with vertical pieces of 2"x4" every 3 feet to prevent the side of bed from bowing.

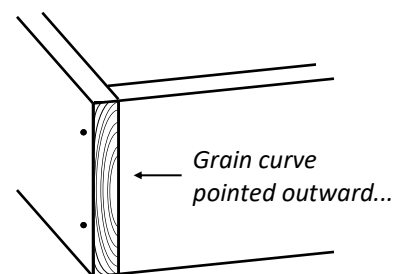
### A Few Assembly Recommendations:

When assembling the bed do the final tightening of screws after it is placed and leveled. Then tighten the screws and fill the bed with soil.

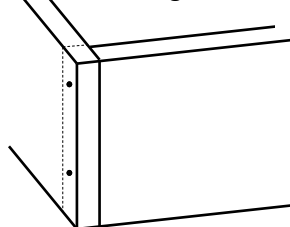
### Lumber End Cuts and Grain

With wider boards, in particular green hardwoods, they will have a tendency to bow along the grain of the end cut. When assembling the bed corners orient the grain with the curve directed outward - as shown in the illustration to the right.

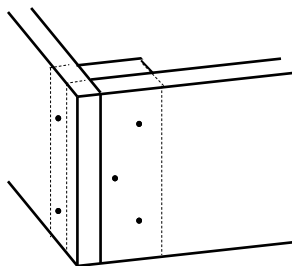
When working with cedar some carpenters will paint the board ends with a high-quality exterior grade wood glue. This can help prevent, but not guarantee, board ends from rotting and splitting.



### Drilling Patterns for Screws



Lag Screw placement on corner joint for boards thicker than 1 1/2 inches



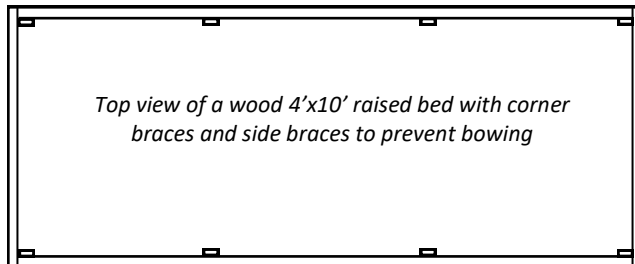
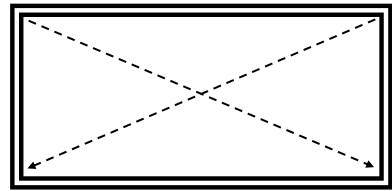
Decking screws placement for bed with corner braces

### Washers

With lag screws use washers. Using a washer prevents the lag screw head from digging into the lumber and also allows the screw to drawing the boards tighter together for a stronger corner

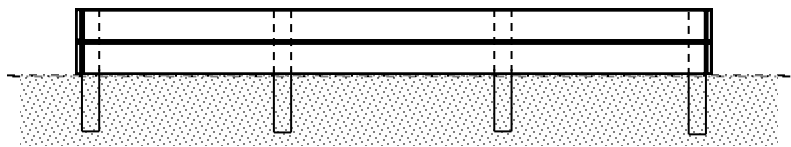
## A Few Assembly Recommendations — continued...

You can check to see if your garden bed is square by using a Carpenter's Square or Triangle. If you do not have these the factory-cut corner of a piece of plywood (or even a book or magazine) can work to check if square by aligning it with inside corner of bed. The square of a garden bed can also be checked with a tape measurer. Measure diagonally from one corner to the other, then measure the distance between the other two - when the two measurements are the same the bed is square.



*Top view of a wood 4'x10' raised bed with corner braces and side braces to prevent bowing*

*Side view of double board wood raised bed with corner braces and side braces. With lumber of a thickness under 1 1/2 inches braces can be set into the ground 12 inches, to prevent bowing - Rebar can also be used on the outside of garden bed.*



### Creating Flush Corners along the Top Edge of the Garden Bed

When assembling your garden bed do so on level ground. If you have access to a flat concrete or asphalt area this is ideal. Drill lumber and assemble your bed upside down you can square then press the corner boards to the ground to create a flush edge for the bed. Also inspect your boards for defects before assembling them, always use the best edge for the top of the bed. An irregular edge should be in contact with the soil where it will not be seen and be a "splinter" waiting to happen.

### Level the Garden Bed

Leveling your garden bed is important for both aesthetic and functional reasons. A level bed makes watering more consistent and effective. With a level bed the water does not drain to one end of the bed, but has the tendency to puddle around the plant or row of plants you are watering. This allows you to concentrate and direct the water to the plant it is intended for. Also if you want to flood the bed, as a technique of watering, a level bed will allow the water to be evenly distributed and then seep into the soil.

### Filling Your Garden Bed

After your garden bed is placed you are ready to fill it with soil. It is important to clear the area of perennial weeds. If there is a heavy concentration of weeds in the area it can be covered with a cardboard or five layers of newspaper. This is also effective when locating the bed on grass lawn. Before laying in the weed cover or adding soil you can pierce the ground with a shovel or spading fork. This will aerate the topsoil and facilitate, over time, essential nutrients and beneficial organisms entering the subsoil of your garden bed.

### Soil for Your Garden Bed

Healthy Soil = Healthy Plants. You will want to use a mixture of soil and compost in your new garden bed. Compost is essential because it improves the structure, increases water-holding capacity and provides essential nutrients and beneficial organisms for your soil. On an ongoing basis you will need to add compost and/or plant a green manure crop once a year to have healthy soil and plants. A 4x8 foot garden bed will need approximately 1 1/2 cubic yards of soil.

Sourcing garden soil - an ideal garden mix is equal parts of topsoil, aged manure (horse or cow) and aged leaf mold. This or similar mixes can be purchased from landscape suppliers like H. Hafner & Sons.

- Ask for a "garden mix" or blend of "topsoil & compost". When you ask for "topsoil" what you get is clay and that will not support the growth of quality plants, shrubs, trees, or grass for that matter. Soil and compost can also be purchased in bags from nurseries - when selecting soil be sure it is "garden soil" not "potting soil".

- When purchasing in bulk from a landscape supplier order the soil mix after a dry spell of a few days - that way it will be lighter and not compacted.

- If soil mix will not be used right away cover it with a tarp or plastic, this protects it from the rain and direct sunlight (heat) both can harden and/or compact the soil making it difficult to work with...

## **Gardening Suppliers – Local and Mail Order**

There are many excellent options for purchasing vegetable starts and gardening supplies in Cincinnati and through the internet and mail order. This list does not list all greenhouse and supplier options - it is intended to provide home and community gardener's information on local suppliers, in addition to several mail order options, where I have purchased products used in the Turner Farm Community Gardens. If you are looking for specific items, I recommend calling the vendor to confirm availability.

– Peter Huttinger

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### **General Gardening Supplies**

- Including Organic supplements, fertilizers, seeds and seed starting supplies

Growing Trade Pet & Plant

3840 Spring Grove Ave

Cincinnati, OH 415223?

513-541-1321

<https://growingtradestore.com/>

Also sells:

Organic seeds, Seed potatoes, Onion sets, and seasonal vegetable starts

Chicken and rabbit feed and supplies

Gardens Alive

513-354-1482

[www.gardensalive.com](http://www.gardensalive.com)

Environmentally Responsible Products. Natural and organic supplies for controlling pests, disease and weeds for the home vegetable gardener. Also, a source for seeds, seed potatoes, onion sets, seasonal and perennial plants as well as tools and season extension supplies. Web site has a pest and disease guides.

Ohio Earth Food

5488 Swamp Street, N.E.,

Hartsville, Ohio 44632

330-877-9356

<https://ohioearthfood.com/>

Natural, Organic growing products for Farms, Greenhouses, Lawns and Gardens

### **Spring and Fall Vegetable Starts Plants**

Funke's Nursery and Greenhouse

4798 Gray Rd.

Cincinnati, OH 45232

513-541-8170

<http://www.funkes.com/>

Offers a very large selection of heirloom and hybrid tomatoes and peppers (sweet and hot) as well as other vegetable and flowering bedding plants and gardening supplies.

A J Rahns Greenhouses

4944 Gray Rd.

Cincinnati, OH 45232

## Seeds

Fedco Seed & Moose Tubers

Provides cold-hardy varieties shipped in season, and gardening supplies year-round.

207-426-9900

[www.fedcoseeds.com](http://www.fedcoseeds.com)

For tubers and exotics

[www.fedcoseeds.com/moose/](http://www.fedcoseeds.com/moose/)

High Mowing Seed

[www.highmowingseeds.com](http://www.highmowingseeds.com)

<https://exchange.seedsavers.org/>

Vegetable and cover crop seed

Walnut Creek Seeds

330-475-6352

[www.walnutcreekseeds.com](http://www.walnutcreekseeds.com)

Specializes in cover crop seed, offers an excellent fall (winter kill) cover crop mix.

## Source for Composted Horse Manure, Leaf Mold and Topsoil

H. Hafner & Sons

5445 Wooster Rd.

Cincinnati, OH 45226

513-321-1895

[www.hafners.com](http://www.hafners.com)

If you can afford it, I recommend ordering a three-part mix of equal parts topsoil, aged horse manure and aged leaf mold. No matter what you will need to add a wheelbarrow (a standard wheelbarrow holds 6 cubic feet) of mature compost per 50 square feet of garden bed after the first growing season. For example, a 4 x 8-foot wood garden bed is 32 square feet. Square footage is calculated by multiplying the length by the width of your garden bed.

Then on an ongoing basis adding compost and/or planting a green manure crop once a year is recommended.

Note: There are 27 cubic feet in 1 cubic yard. To help you calculate your order H. Hafner & Sons has a materials calculator on their web site:

<http://www.hafners.com/cincinnati-landscape-services/materials-calculator.html>

Product descriptions are from the H. Hafner & Sons web site.

### Terra-Mix Topsoil

1-part topsoil, 1-part mushroom compost, 1-part mulch fines. This mix is very loamy and allows for excellent drainage. Used in boxed planters or containers.

### Aged Leaf Mold

Collected every fall by municipalities and individuals. Aged roughly 6 years prior to sale. Good addition to boxed planters or containers. Finely shredded prior to sale. Unit of sale is the cubic yard.

### Mushroom Compost

Delivered from mushroom farms in Pennsylvania, this product boasts high nitrogen content. Good for use as a planting medium. Unit of sale is the cubic yard.

### Aged Horse Manure

Collected from various farms throughout the tristate area. Material is aged roughly 5 years before sale.

Perfect for additions to gardens and planting beds, finely shredded prior to sale.

### Garden Mix Topsoil

50% topsoil, 30% aged horse manure, 20% aged leaf mold.

Good for landscaping, not recommend this mix because the topsoil (heavy clay) is too high.